An Experimental Study of the Influence of Solidification Thermal Variables upon Microstructure of Al-Si-Cu Alloys

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Solidification of metals involves the transformation of the molten metal back into the solid state. The transformation of a liquid into solid is probably the most important phase transformation in applications of science and engineering materials [1, 2]. Solidification structures impact heavily on the products final characteristics and therefore predict microstructure resulting from the solidification thermal variables is essential for the programming process using solidification. The aim of this work is obtain correlations between thermal solidification variables and the microstructure of Al-10wt%Si-2wt%Cu and Al-10wt%Si-5wt%Cu alloys. These alloys were solidified under upward unsteady state heat flow conditions. Heat was directionally extracted only through a water-cooled bottom made of steel (SAE 1020). The results include tip growth rate (V_L), cooling rate (T_R) and primary dendrite arm spacing (λ_1) as a function of solidification conditions imposed by the metal/mold system.For both alloys, it is found that the primary dendrite arm spacing decreases with the increase in tip growth rate and cooling rate.

Acknowledgements:

The authors acknowledge financial support provided by PROEQUIPAMENTOS 2014-CAPES (Higher Education Personnel Improvement Coordination).

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